CLAIMS

What is claimed is:

1. An apparatus for removing thermal energy from a nuclear reactor, comprising:

a heat pipe configured to absorb thermal energy produced by the nuclear reactor;

a first compartment thermally coupled to said heat pipe and configured to contain a first gas; and

a second compartment thermally coupled to said heat pipe, said second compartment configured to contain a second gas and configured to isolate said second gas from said first gas.

2. The apparatus for removing thermal energy from the nuclear reactor of claim 1, further comprising a third compartment thermally coupled to said heat pipe and configured to contain a third gas.

3. The apparatus for removing thermal energy from the nuclear reactor of claim 2, wherein said third compartment is configured to isolate said third gas from said first gas.

4. The apparatus for removing thermal energy from the nuclear reactor of claim 2, wherein said third compartment is configured to isolate said third gas from said first gas and said second gas.

5. The apparatus for removing thermal energy from the nuclear reactor of claim 2, further comprising a fourth compartment thermally coupled to said heat pipe and configured to contain a fourth gas.

6. The apparatus for removing thermal energy from the nuclear reactor of claim 5, wherein said fourth compartment is configured to isolate said fourth gas from said first gas.

7. The apparatus for removing thermal energy from the nuclear reactor of claim 5, wherein said fourth compartment is configured to isolate said fourth gas from said first gas, said second gas, and said third gas.

8. The apparatus for removing thermal energy from the nuclear reactor of claim 5, further comprising a fifth compartment thermally coupled to said heat pipe and configured to contain a fifth gas.

9. The apparatus for removing thermal energy from the nuclear reactor of claim 8, wherein said first compartment is configured to isolate said fifth gas from said first gas.

10. The apparatus for removing thermal energy from the nuclear reactor of claim 5, wherein said fifth compartment is configured to isolate said fifth gas from said first gas, said second gas, said third gas and said fourth gas.

11. The apparatus for removing thermal energy from the nuclear reactor of claim 1, further comprising a plurality of heat pipes in addition to said heat pipe that are thermal coupled to said first compartment and said second compartment.

12. The apparatus for removing thermal energy from the nuclear reactor of claim 8, further comprising a plurality of heat pipes in addition to said heat pipe that are thermal coupled to said first compartment, said second compartment, said third compartment, said fourth compartment and said fifth compartment.

13. The apparatus for removing thermal energy from the nuclear reactor of claim 1, said heat pipe comprising:

an inner pipe enclosing nuclear fuel of the nuclear reactor;

an outer pipe enclosing the inner pipe; and

a space interposed between said inner pipe and said outer pipe.

14. The apparatus for removing thermal energy from the nuclear reactor of claim 13, wherein said space is a vapor space that is configured to contain a fluid.

15. The apparatus for removing thermal energy from the nuclear reactor of claim 13, wherein said outer pipe has first protrusion extending into said first compartment.

16. The apparatus for removing thermal energy from the nuclear reactor of claim 16, further comprising a second protrusion extending into said second compartment.

17. A method for removing thermal energy from a nuclear reactor, comprising the steps of:

absorbing thermal energy produced by the nuclear reactor;

transferring at least a first portion of the thermal energy to a first compartment and at least a second portion of the thermal energy to a second compartment;

introducing a first gas into said first compartment and a second gas into said second compartment; and

isolating said second gas introduced into said second compartment from said first gas introduced into said first compartment.

18. The method for removing thermal energy from the nuclear reactor of claim 17, further comprising the steps of:

transferring at least a third portion of the thermal energy to a third compartment;

introducing a third gas into said third compartment; and

isolating said third gas introduced into said third compartment from said first gas introduced into said first compartment.

19. The method for removing thermal energy from the nuclear reactor of claim 18, further comprising the step of isolating said third gas introduced into said third compartment from said second gas introduced into said second compartment.

20. The method for removing thermal energy from the nuclear reactor of claim 18, further comprising the steps of:

transferring at least a fourth portion of the thermal energy to a fourth compartment;

introducing a fourth gas into said fourth compartment; and

isolating said fourth gas introduced into said fourth compartment from said first gas introduced into said first compartment.

21. The method for apparatus for removing thermal energy from the nuclear reactor of claim 20, further comprising the steps of isolating said fourth gas introduced into said fourth compartment from said second gas introduced into said second compartment and said third gas introduced into said third compartment.

22. The method for removing thermal energy from the nuclear reactor of claim 20, further comprising the steps of:

transferring at least a fifth portion of the thermal energy to a fifth compartment;

introducing a fifth gas into said fifth compartment; and

isolating said fifth gas introduced into said fifth compartment from said first gas introduced into said first compartment.

23. The method for apparatus for removing thermal energy from the nuclear reactor of claim 22, further comprising the steps of isolating said fifth gas introduced into said fifth compartment from said second gas introduced into said second compartment, said third gas introduced into said third compartment and said fourth gas introduced into said fourth compartment.

24. A vehicle, comprising:

a nuclear reactor;

an apparatus for removing thermal energy from said nuclear reactor, said apparatus comprising:

a heat pipe configured to absorb thermal energy produced by the nuclear reactor;

a first compartment thermally coupled to said heat pipe and configured to contain a first gas; and

a second compartment thermally coupled to said heat pipe, said second compartment configured to contain a second gas and configured to isolate said second gas from said first gas; and

an energy conversion system configured to convert at least a portion of said thermal energy removed from said nuclear reactor by said apparatus into power for the vehicle.

25. The vehicle of claim 24, wherein said vehicle is a spacecraft.

26. The vehicle of claim 24, wherein said energy conversion system is configured to implement a Brayton energy conversion cycle for conversion of said portion of said thermal energy removed from said nuclear reactor by said apparatus into power for the vehicle.